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13. ABSTRACT Describes a method for evaluation of POL support equipment operational and functional performance characteristics. Identifies supporting test, facilities, and equipment required. Provides procedures for batch interface detection, fuel contamination level, switching manifold, strainer, and trap tests. Applicable to hoses, pipelines, pressure regulators, switching manifolds, monitoring devices, batch detectors, fuel testers, filters, separators, strainers and traps.			

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14	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	Batch Interface Detection Equip						
	Fuel Tester						
	Hoselines						
	Pipeline						
	Pipeline Manifolds						
	POL Filter/Separator Equip						
	POL Storage and Distribution						
	POL Supply System						

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**U.S. ARMY TEST AND EVALUATION COMMAND
SYSTEM ENGINEERING TEST OPERATIONS PROCEDURES**

AMSTE-RP-702-108

*Test Operations Procedure 9-2-294

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POL SUPPORT EQUIPMENT

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**SECTION I
GENERAL**

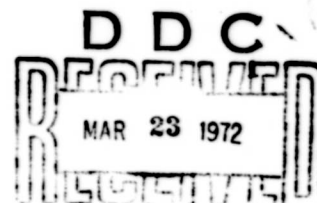
1. **Purpose and Scope.** This TOP describes test procedures for evaluating the operational and performance characteristics of POL support equipment. Equipment covered includes: hoses/pipelines, pressure regulators, switching manifolds, monitoring devices, batch detectors, fuel testers, filter-separators, strainers and traps. From the tests listed in Section II, the test director can select those that will satisfy the requirements for the particular test item and the particular test type (i.e., engineering test, initial production test, etc.). This document provides for simulated environmental testing but does not include service testing or environmental testing at climatic test sites.

2. **Background.** Modern Army tactical operations, involving the use of mechanized ground equipment, aircraft and miscellaneous mobile field equipment, require that adequate supplies of petroleum, oil and lubricants (POL) be readily available when and where needed. To provide these POL requirements necessitates an efficient and varied handling and distribution system, one that can operate under all possible

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*This TOP supersedes NTPs 9-2-298 (25 Oct 67) and 9-2-299 (22 Jul 69), including all changes.

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a. Be sufficiently durable to resist the effects and hazards of the weather, chaffing and wear from contact with every conceivable type of terrain, buffeting by waves and tides on water surfaces and collapse from external pressure when below water surface.

c. Include means of regulating internal pressures created by increases and decreases in terrain elevations and thermal heating.

e. Detect and indicate changes in POL composition.

g. Be able to test fuel for contamination and filter out any contaminants.

1. Provide a maintenance package for cleaning and general maintenance of the system components.

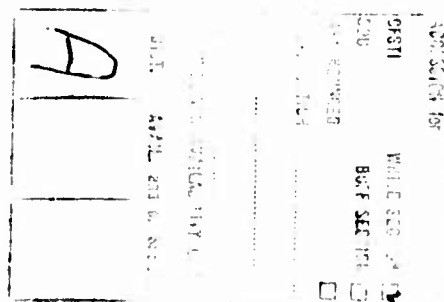
a. Test standard POL products (paras 5 and 6).

b. Contaminants (liquid and solid) (paras 6 and 8).

c. Signal generator (para 7).

d. Laboratory balances (para 8).

e. Pumps (paras 5, 6 and 8).



SECTION II TEST PROCEDURES

4. Supporting Tests. Common Engineering MTPs/TOPs, Military Standards, the tests defined in Section III, and other published documents to be considered in formulating a test plan are as follows:

<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
a. Pre-operational Inspection	10-3-500
(1) Operator Training and Familiarization	10-2-501
(2) Photographic Coverage	7-3-519
b. Physical Characteristics	10-2-500
c. Safety	10-2-508
d. Hydrostatic Tests	
(1) Pipelines and housing for filter-separators, manifolds, strainers and traps	ASME code for Unfired Pressure Vessels
(2) Pumps	9-2-183
(3) Containers	FED STD 101B Method 5009
(4) Hoselines	FED STD 601 Method 10211
(5) Pressure Regulator	MIL-R-23047A Para 4.6.3
e. Performance Tests	
(1) Pumps	9-2-183
(2) Filter-Separators	MIL-F-8901B Paras 4.3, 4.4, 4.5, 4.6
(3) Batch Interface Detector (Refer to para 5)	
(4) Pressure Regulator	MIL-R-23047A Paras 4.6.1, 4.6.2, 4.6.4
(5) Fuel Tester (Refer to para 6)	
(6) Switching Manifold (Refer to para 7)	
(7) Strainers and Traps (Refer to para 8)	MIL-S-17849C Para 4.4
f. Environmental Tests	MIL-STD-810B Method 501
(1) Temperature	and AR 70-38
(2) Sunshine	4-2-826
(3) Rain	2-2-815
(4) Humidity	4-2-820

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<u>TEST SUBJECT TITLE</u>		<u>PUBLICATION NO.</u>
(5)	Fungus	4-2-818
(6)	Salt Fog	MIL-STD-810B
		Method 509
(7)	Dust	Method 510
(8)	Immersion	Method 512
(9)	Vibration	4-2-804
(10)	Rough Handling	4-2-602
g.	Transportability	10-2-503
	Air	7-2-515
h.	Human Factors Evaluation	10-2-505
i.	Reliability	AMC PAM 702-3
		3-1-002
j.	Durability	10-2-502
k.	Maintenance Evaluation	10-2-507
l.	Value Analysis	USAMC SUPPL 1
		to AR 11-26

SECTION III SUPPLEMENTARY INSTRUCTIONS

5. Batch Interface Detector.

a. Objective. To determine that the test item will detect the differences in the specific gravity of POL products injected into it and initiate a change to the switching manifold to select the proper POL distribution outlet.

b. Method. The test item is installed in the input pipeline at a predetermined distance from the switching manifold. POL products of known and varying specific gravities are pumped into the pipeline and the test item is observed for proper indication of each change of POL product.

c. Data Required.

(1) Record for each POL product transferred to the input pipeline:

(a) Type and specific gravity.

(b) Time, beginning and ending.

(c) Volume.

(2) Record for each change of batch interface indication:

(a) Specific gravity indicated.

(b) Time, beginning and change.

(c) Subsequent indications and time of change.

d. Analytical Plan. The detection and indication times determined for each change and type of POL product are summarized, analyzed and compared with the requirements of the MN to determine conformance to specifications.

6. Fuel Tester.

a. Objective. To determine that the test item will indicate the contamination level of the POL products and provide a warning or automatic shut off when purity level is degraded.

b. Method. The test item is installed between the final filter-separator unit and the pipehead or hydrant. Pure fuels and fuels with known types and quantities per volume of contaminants (water, solids) are pumped into the pipeline input to the test item. The test item indicator is carefully observed for contamination measurements and for operation of warning system when contamination level exceeds limitations.

c. Data Required.

(1) Type (pure or % contaminated) and quantity of fuel injected with beginning and ending times.

(2) Contamination readings on fuel tester indicator with correlated time information.

(3) Operation of warning system with corresponding times.

d. Analytical Plan. The injected contaminated fuel types, volume and times are correlated with the indications registered by the test item and the degree of accuracy determined. This determination and accuracy of warning system operation is compared with the requirements of the MN to determine conformance to specifications.

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7. Switching Manifold.

a. Objective. To determine the capability of the test item to react to the indications of the batch interface detector or similar equipment with accurate and fast switching to selected distribution outputs.

b. Method. The test item is instrumented to receive simulated batch interface detector signals from an appropriate signal generator. Signals are generated simulating POL products of varying specific densities and the test item is observed for selection of proper distribution outlets compatible with each signal received.

c. Data Required.

- (1) Applied generator signal and time.
- (2) Selected distribution outlet operation and time.

d. Analytical Plan. The applied signals and the selected distribution outlets are correlated by the common times and the accuracy of test item operation determined. This information is compared with the requirements of the MN to determine conformance to specifications.

8. Strainers and Traps.

a. Objective. To determine the capability of the test item to remove solid contaminants from POL products.

b. Method. The internal screen of the test item is removed, inspected to ensure cleanliness, weighed and then replaced. The test item is installed in a section of pipeline or hoseline and a specified volume of fuel containing a known quantity of contaminant is pumped through the test item. The internal screen and the sediment found in the test item after test is removed and weighed.

c. Data Required.

- (1) Weight of solid contaminant in test fuel.
- (2) Weight of screen before and after test.
- (3) Weight of sediment in strainer or trap after test.

d. Analytical Plan. The original weight of the screen is subtracted from the weight of screen and sediment after test. The result is divided by the known weight of contaminant in the test fuel and this result multiplied by 100 to obtain the percentage of contaminant removed by the test item. This percentage is compared with the requirements of the MN to determine conformance to specifications.

(b) Time, beginning and ending.

(c) Volume.

(2) Record for each change of batch interface indication:

(a) Specific gravity indicated.

(b) Time, beginning and change.

(c) Subsequent indications and time of change.

d. Analytical Plan. The detection and indication times determined for each change and type of POL product are summarized, analyzed and compared with the requirements of the MN to determine conformance to specifications.

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c. Data Required.

(1) Type (pure or % contaminated) and quantity of fuel injected with beginning and ending times.

(2) Contamination readings on fuel tester indicator with correlated time information.

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d. Analytical Plan. The injected contaminated fuel types, volume and times are correlated with the indications registered by the test item and the degree of accuracy determined. This determination and accuracy of warning system operation is compared with the requirements of the MN to determine conformance to specifications.

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b. Method. The test item is instrumented to receive simulated batch interface detector signals from an appropriate signal generator. Signals are generated simulating POL products of varying specific densities and the test item is observed for selection of proper distribution outlets compatible with each signal received.

c. Data Required.

- (1) Applied generator signal and time.
- (2) Selected distribution outlet operation and time.

d. Analytical Plan. The applied signals and the selected distribution outlets are correlated by the common times and the accuracy of test item operation determined. This information is compared with the requirements of the MN to determine conformance to specifications.

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- (1) Weight of solid contaminant in test fuel.
- (2) Weight of screen before and after test.
- (3) Weight of sediment in strainer or trap after test.

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APPENDIX
REFERENCES

1. AR 70-38, "Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions."
2. USAMC Supplement 1 to AR 11-26, "Value Engineering."
3. USAMC Pamphlet 703-3, "Quality Assurance - Reliability Handbook."
4. FED. TEST METHOD STD. NO. 101B, "Preservation, Packaging, and Packing Materials: Test Procedures."
5. FED. TEST METHOD STD. NO. 601, "Rubber: Sampling and Testing."
6. MIL-STD-781B, "Reliability Tests: Exponential Distribution", including change 1.
7. MIL-STD-810B, "Environmental Test Methods", including notices 1 thru 4.
8. MIL-F-8901B, "Filter-Separators, Aviation and Motor Fuel, Ground and Shipboard Use, General Requirements and Test Procedures for", including amendment 1.
9. MIL-R-23047A, "Regulator Assembly, Pressure, Skid Mounted", including amendment 2.
10. MIL-S-17849C, "Strainer, Sediment, Pipeline, Duplex", including amendment 3.
11. American Society of Mechanical Engineers, "ASME Code for Unfired Pressure Vessels."